

CLAIMS

1. An electron-emitting element comprising:
an electric field applying portion composed of a dielectric;
a first electrode formed on one surface of this electric field applying
5 portion; and
a second electrode formed on said one surface of the electric field applying
portion, and forming a slit in cooperation with said first electrode.
2. An electron-emitting element according to claim 1, wherein a carbon
coating is applied to said first electrode, said second electrode and said slit.
- 10 3. An electron-emitting element according to claim 1 or 2, further
comprising a third electrode arranged at a certain space to said first and second
electrodes, wherein space between said first and second electrodes and said third
electrode is vacuum.
4. An electron-emitting element comprising:
15 an electric field applying portion composed of at least one of a piezoelectric
material, an electrostrictive material and an antiferroelectric material;
a first electrode formed on one surface of this electric field applying
portion; and
a second electrode formed on said one surface of the electric field applying
20 portion, and forming a slit in cooperation with said first electrode.
5. An electron-emitting element according to claim 4, wherein a carbon
coating is applied to said first electrode, said second electrode and said slit.
6. An electron-emitting element according to claim 4 or 5, further
comprising a third electrode arranged at a certain space to said first and second
25 electrodes, wherein space between said first and second electrodes and said third
electrode is vacuum.
7. An electron-emitting element according to claim 6, wherein said
electric field applying portion also acts an actuator and controls the quantity of
emitted electrons by the displacement motion of said electric field applying
30 portion.
8. An electron-emitting element according to one of claims 3, 6 and 7,
further comprising:
a voltage source for applying a direct offset voltage to said third electrode;

and

a resistor arranged in series between this voltage source and said third electrode.

9. An electron-emitting element according to one of claims 1 to 8,
5 wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

10. An electron-emitting element according to one of claims 1 to 9, further comprising a capacitor arranged in series between said first electrode and said voltage source.

10 11. An electron-emitting element according to one of claims 1 to 8, further comprising a fourth electrode formed on the other surface of said electric field applying portion and facing to said first electrode.

12. An electron-emitting element according to claim 11, wherein a pulse
15 voltage is applied to said fourth electrode and a direct offset voltage is applied to said second electrode.

13. An electron-emitting element according to one of claims 1 to 12, further comprising a resistor arranged in series between said second electrode and a direct offset voltage source.

14. An electron-emitting element according to one of claims 1 to 13,
20 wherein said electric field applying portion has the relative dielectric constant not less than 1000.

15. An electron-emitting element according to one of claims 1 to 14, wherein said slit has the width not more than 500 μ m.

16. An electron-emitting element according to one of claims 1 to 15,
25 wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

17. An electron-emitting element according to one of claims 1 to 16, wherein said first electrode and said second electrode each have carbon nanotubes.

30 18. A field emission display comprising:
a plurality of electron-emitting elements arranged in two dimensions; and
a plurality of phosphors each being arranged with a certain space to each of these electron-emitting elements,

each of said electron-emitting elements having:

an electric field applying portion made of a dielectric;

a first electrode formed on one surface of this electric field applying portion; and

5 a second electrode formed on said one surface of the electric field applying portion, and forming a slit in cooperation with said first electrode.

19. A field emission display according to claim 18, wherein a carbon coating is applied to said first electrode, said second electrode and said slit.

20. A field emission display according to claim 18 or 19, wherein a third
10 electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

21. A field emission display comprising:

a plurality of electron-emitting elements arranged in two dimensions; and

15 a plurality of phosphors each being arranged with a certain space to each of these electron-emitting elements,

each of said electron-emitting elements having:

an electric field applying portion composed of at least one of a piezoelectric material, an electrostrictive material and an antiferroelectric material;

20 a first electrode formed on one surface of this electric field applying portion; and

a second electrode formed on said one surface of the electric field applying portion, and forming a slit in cooperation with said first electrode.

22. A field emission display according to claim 21, wherein a carbon
25 coating is applied to said first electrode, said second electrode and said slit.

23. A field emission display according to claim 21 or 22, wherein a third electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

30 24. A field emission display according to claim 23, wherein said electric field applying portion also acts as an actuator and controls the quantity of emitted electrons by the displacement motion of said electric field applying portion.

25. A field emission display according to one of claims 20, 23 and 24,

wherein each of said electron-emitting elements comprises:

a voltage source for applying a direct offset voltage to said third electrode;

and

a resistor arranged in series between this voltage source and said third

5 electrode.

26. A field emission display according to one of claims 18 to 25, wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

27. A field emission display according to one of claims 18 to 26, wherein
10 each of said electron-emitting elements further comprises a capacitor arranged in series between said first electrode and said voltage signal source.

28. A field emission display according to one of claims 18 to 26, wherein each of said electron-emitting elements further comprises a fourth electrode being formed on the other surface of said electric field applying portion and
15 opposite to said first electrode.

29. A field emission display according to claim 28, wherein a pulse voltage is applied to said fourth electrode and a direct offset voltage is applied to said second electrode.

30. A field emission display according to one of claims 18 to 29, wherein
20 each of said electron-emitting elements further comprises a resistor arranged in series between said second electrode and said direct offset voltage source.

31. A field emission display according to one of claims 18 to 30, wherein said electric field applying portion has the relative dielectric constant not less than 1000.

25 32. A field emission display according to one of claims 18 to 31, wherein said slit has the width not more than 500 μ m.

33. A field emission display according to one of claims 18 to 32, wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

30 34. A field emission display according to one of claims 18 to 33, wherein said first electrode and said second electrode each have carbon nanotubes.

35. A field emission display according to one of claims 18 to 34, further comprising a substrate having a plurality of electron-emitting elements arranged

